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POLICE WORK IN AGRICULTURE.

THE functions of an Agricultural Department are very different under the different conditions of the various countries. And, from the Departmental point of view, a distinction has to be drawn between the physical and the human elements of those conditions. On the physical side the crops that have to be handled will differ with climate and soil. Problems of the arid tracts found in the Punjab, Mesopotamia and elsewhere, where growth is only rendered possible by irrigation, are very different from those of the island and coastal tracts with their abundant water supplies. These problems, however, are all interpretable into terms of the physiology of plant or animal growth, and deal with the relationship between the plant or animal and its environment ; are interpretable, that is, in terms of the natural sciences.

The human side is much more complex. If the natural sciences have a long road to travel before cause and effect can be well correlated, the science dealing with humanity, commonly called psychology, is hardly at the commencement of its travels, and this is a point that a Department has to bear in mind if it is to succeed. Let us make the point clear by a concrete reference. In a country only recently opened up with a more or less dense population of low standing in the scale of civilisation, and this is the condition of a considerable portion of the tropical empire, a Department must adopt very different methods to those which can be put into practice in one of the older colonies occupied by an intelligent and progressive body of colonists. Again, its policy will be very different in a country of small holdings, where the cultivator is one of small means and farms on an individual basis, to its policy in a locality where expensive crops are grown and a capitalistic basis adopted for farming. In the former case the Department must take a greater part in the economy of agricultural development and practice. It must organise seed supplies of those crops which find a foreign market and it may have to organise the means of marketing. If there be no special Department for the purpose it may also have to organise credit on co-operative lines.

In the latter case the larger unit is capable of looking after its own financial interests ; it is capable of making its own marketing arrangements. If the unit is not large enough to find an independent market for its individual produce, as may be the case when the unit handled by the

trade is large, the agricultural interests are sufficiently advanced intellectually to appreciate the need of co-operation to ensure uniformity of product. An example of this is to be found in fruit producing areas. Here the function of a Department is limited to advisory work; advice to the Government and technical advice to the planting community. Research and experiment become its major functions, for by these the local knowledge necessary to sound advice is obtained.

The Department is faced with its most complex problems in those countries where the communities are mixed; where capitalistic farming is intermingled with small holdings. Here there are two communities, one capable, the other incapable, of looking after its own interests and unless the small holder grows a crop the produce of which can be handled by the large estate, as in the case of cane farming, it may be necessary for the Department to run the dual functions collaterally.

In our last editorial we dealt with the question of disease and we pointed out that the risk of disease was very much greater in the case of the more highly organized capitalistic farming. Not only are the areas under one crop more extended but farming of this nature is definitely to supply a foreign market which requires graded produce. Consequently the tendency is to plant a single variety and this exposes the whole crop to the danger of infection. In the case of small holdings, each of which produces the essential needs of the holder's family, such large expanses are not common and many of the crops need not be graded for they supply merely the local needs. The function of an Agricultural Department in meeting disease under these different conditions must necessarily differ.

As a general principle we would suggest that the main function of an Agricultural Department is to assist by advice the agricultural community. To accomplish this effectively it must gain the confidence and goodwill of that community. This it can hardly do if it is to be saddled with the police work, which regulations introduced to control pests entail. Again, taking our two main systems of agricultural production, we see the danger from pests is greatest under the capitalistic system, a system which offers the greatest hope of effective control. For if co-operative action among an intelligent planting community can control varieties and organise grading, it is capable of organising co-operative action for the control of disease. Here the Departmental activity is limited to advisory action in recommending methods and, by its research, to producing resistant strains. Under the small holding system, luckily, risks are not so great, for here the Department may have to undertake the work of control as it may also have to undertake organization in the other directions indicated.

The most difficult case for effective police work occurs where both systems occur intermingled. Here the work of the large holders may be negatived by the indifference of the small holder whose cultivation is contiguous or intermingled with that of the large estate. The problem here presented is a difficult one and we cannot now attempt to solve it in full; it is one of the outstanding questions of agricultural development. We have merely attempted to put forward a point of view and to indicate the considerations which should not be lost sight of in any discussion of remedial measures. Briefly they are that the Department's activities demand primarily that it should secure the confidence of the Agricultural community and that it cannot effect this if it is to act as a police organisation. In the matter of disease and methods of control its function is advisory, to advise the community on the best methods of control and to advise Government as to the regulations required to make that control effective. It should not be burdened with the task of seeing those regulations are effectively enforced.

But if a ready solution cannot be offered it is, perhaps, possible to make tentative suggestions. The real difficulty appears to us to be this. The danger of disease and the need for protective measures are not generally understood, more especially among the small holders. Legislative regulations of themselves, therefore, can be of little effect, for their enforcement meets with opposition. They require to be preceded by an educational campaign explaining the need and this is work an Agricultural Department may well organise. When that campaign has been effective the difficulties of enforcement will be much diminished, but even now an agency other than the Department requires to be found. The dangers of entrusting the enforcement of regulations to private agency are obvious and legislation of this nature could be permissive only and might, therefore, fail to be effective, but these are difficulties that may be overcome. We merely throw out the suggestion that the required agency may be found in a truly representative Agricultural Society.

THE AMANI INSTITUTE.

MR. WILLIAM NOWELL who was recently appointed Director of the Department of Science and Agriculture, British Guiana, has been selected to fill the post of Director of the Amani Institute in Tanganyika. Amani is the research station established by the German Government before the war, and it is now proposed to revive it from its semi-abandoned condition and make it serve again for research and investigation, particularly in connection with the agriculture of the British colonies and dependencies in Eastern Africa, and to develop its scope to the status of an Imperial institution.

Mr. Nowell has been selected by the Secretary of State for the Colonies as the most suitable man available for this appointment. Mr. Nowell's work in the West Indies, covering a period of fifteen years, and dealing with agricultural problems and research has indicated his fitness for the future development which is confidently expected to take place at Amani.

RUBBER IN AFRICA.

(*Concluded.*)

Judging from the meagre data available on present plantings, experimental and commercial, there are large areas within the equatorial belt where, so far as climate and soil are concerned, Hevea could be expected to yield returns in latex that would compare favourably with the average yields in the Middle East. There are, of course, variations in climate and soil within the belt that would need very careful study before the optimum conditions for Hevea planting could be determined. In some places the rainfall is excessively heavy for a part of the year, and in others there is a more strongly stressed dry season. In either case the number of days throughout the year in which successful tapping could be maintained might be reduced to such an extent as to diminish the yield per acre.

The climatic conditions under which rubber is grown in Uganda are exceptional. The plantations here are located at an altitude of about 4,000 feet above sea level, near the Equator. The average rainfall is about 50 inches, well distributed throughout the year; the mean annual temperature is about 72°F. and is much lower than is usually considered desirable. While no data are available, the relative humidity is probable high. The excellent soil conditions especially capacity to retain moisture, offset, in part at least, the low annual rainfall. Growth in Uganda is slower than in regions with higher average temperature; consequently, it takes seven instead of five or six years for the trees to reach tapping age.

It is roughly estimated that there are some 5,000 acres of planted Hevea rubber in the Belgian Congo, all of which is said to be mature. This is mainly located in the big bend of the Congo River near the Equator, where the mean annual temperature is from 76° to 78°F. and the rainfall between 60 and 70 inches, well distributed throughout the year.

Recent statistics from Nigeria indicate that there are about 3,000 acres of planted Hevea under European control and 5,000 acres owned by natives. The mean annual temperature is around 80°F., and over large areas the rainfall is above 100 inches, fairly well distributed throughout the year, although some regions show a rather stressed dry season of two or three months.

In the Gold Coast, no acreage statistics are available, but from the number of trees it would seem that at least the equivalent of 800 acres of Hevea has been planted. The temperature average is near 80°F. Over limited areas the rainfall is sufficient in quantity and well enough distributed throughout the year for Hevea.

In the British sphere of influence in the Cameroons it is roughly estimated that there is the equivalent of 7,000 acres of planted Hevea, mostly mixed with other rubber species or cacao. No late statistics are available for the French sphere of influence. While over very limited areas precipitation is excessive (about 400 inches) and might interfere with tapping, in other regions the rainfall is satisfactory, although more or less marked dry seasons may be encountered.

In Liberia 1,400 acres of rubber have been planted. The rainfall is between 100 and 150 inches, with a slightly stressed dry season of two or three months.

There seems to have been little or no Hevea rubber planted on a commercial scale in the other political units of the African equatorial belt. In general the whole of East Africa can be considered climatically unfavourable to the growth of Hevea, although in certain limited areas here and in parts of Madagascar conditions seemingly would not be adverse. The earlier experiments with Hevea planting were not carried on in the most favourable sections in East Africa, hence one can not judge from them what the results might be were more suitable climates chosen.

No comparison as regards capital and production costs can be made between the areas of planted Hevea in Africa and in the Middle East, mainly because there is little available information concerning the costs in Africa and the methods of planting there have generally been different from those of the East.

With few exceptions, in Africa rubber is grown intermixed with other crops, either perennial or annual. This reduces the cost of planting and caring for the rubber until it is old enough to yield returns. Due to this practice, in Uganda some planters figure that the cost of bringing an acre of rubber into bearing is nil; others estimate at around £15 sterling. Estimates of opening costs elsewhere are lacking at the present time.

The published "all in" London production costs for Uganda for 1920-21 are high—on European-owned estates over 30 cents United States currency per pound of rubber. Such costs are based on tappings of immature plantations. Moreover, the freight from Uganda to consuming countries, overhead charges on European-owned estates, and selling charges in London, are high.

Unfortunately, there are at hand no published figures on production costs of Hevea plantations in the other African countries. Climatic conditions are better elsewhere, indicating larger yields, and in general transportation charges would be less than in Uganda.

While it can not be said that Hevea rubber planting in Africa has been successful, the failure is not due entirely to physical conditions nor to adverse economic factors such as labour shortage or poor transportation. In 1914 the planting of Hevea was in a fair way to success; while energy was lost in planting uneconomic species, the production from Hevea plantings had given considerable promise in the way of

profits at the prices then prevailing, although most of the areas had not reached full production. The war interrupted further planting and interfered with the care and production of rubber on the existing plantations. The business depression that followed the war and other causes of less importance affected the world consumption of rubber, causing very low prices. This checked new planting everywhere.

From the data available it is impossible to determine whether, under existing economic conditions, rubber could be produced in Africa in competition with the European-owned plantations of the Middle East, although, due to the general practice of mixed agriculture in Africa, rubber is brought into bearing at much lower costs that in the East. On account of better transportation the chances of competing in production might be better in the regions bordering the Gulf of Guinea than in the interior districts. One American company which is operating a rubber plantation in one of the Gulf countries has stated that its production cost per pound is lower than the figure which is accepted as reasonable in the Middle East, and it is possible that planters elsewhere in Africa could achieve a similar low cost.

The following table shows (in long tons) the shipments of rubber from Africa for the years 1900 to 1923, grouped in the following political divisions (1) British colonies and mandates, (2) French colonies, (3) Belgian Congo, (4) Portuguese colonies, (5) Cameroons, (6) Togoland, and (7) Liberia. Inasmuch as there is no local consumption, exports (the only official figures procurable, can be regarded as equivalent to "production" for all the regions discussed in this review.

Besides the above there were known shipments of 78 long tons in 1924 from Nyasaland and the small British possessions and 1,400 tons from French colonies other than French Equatorial Africa and Madagascar. In 1925 Liberia exported 166 tons to the United States. Information on the shipments from the other political units in these years is lacking.

Production (Exports) of Crude Rubber, Equatorial Africa, 1900-1923.

Years.	British.	French.	Belgian.	Portuguese.	Cameroons.	Togoland.	Liberia.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1900 ..	3,269	3,994	5,511	2,117	538	97	(1)..	15,526
1901 ..	1,909	2,908	5,954	2,497	509	63	(1)..	13,840
1902 ..	1,564	3,415	5,511	1,345	480	71	(1)..	12,386
1903 ..	2,049	4,821	5,806	2,952	689	94	(1)..	16,411
1904 ..	3,512	5,901	4,724	3,442	933	148	(1)..	18,660
1905 ..	3,639	6,109	4,773	2,997	954	113	(1)..	18,585
1906 ..	3,719	7,342	4,748	3,367	1,130	132	101	20,539
1907 ..	3,337	6,425	4,576	2,918	1,466	161	(1)..	18,883
1908 ..	1,717	4,647	4,487	2,943	1,158	144	(1)..	15,096
1909 ..	2,486	6,647	3,691	4,134	1,491	144	(1)..	18,593
1910 ..	3,460	7,304	3,363	3,949	1,927	133	(1)..	20,136
1911 ..	3,118	6,039	3,347	2,923	2,665	142	46	18,280
1912 ..	2,999	6,256	3,454	3,224	2,767	163	42	18,905
1913 ..	2,644	4,596	3,565	2,259	2,832	89	40	16,025
1914 ..	1,390	1,714	2,213	1,684	700	18	(1)..	7,719
1915 ..	618	3,120	2,144	2,247	(1)..	8	(1)..	8,137
1916 ..	1,522	3,856	2,969	1,984	(1)..	41	(1)..	10,372
1917 ..	1,820	4,264	2,828	1,287	152	63	31	10,445
1918 ..	1,228	3,115	1,727	1,049	(1)..	2	(1)..	7,121
1919 ..	1,092	3,337	1,520	547	320	77	127	7,020
1920 ..	943	2,862	1,104	855	563	17	57	6,401
1921 ..	384	1,723	778	216	460	1	6	3,568
1922 ..	255	1,006	1,089	83	(1)..	(1)..	(1)..	2,433
1923 ..	622	2,578	438	90	(1)..	(1)..	3	3,731

(1) No data available.

In general, the policy of the various Governments is to encourage the natives to plant commercial crops. This method has been strikingly used in the Gold Coast, where the acreage in cacao has been increased to such an extent that the Coast has become the chief cacao-producing country in the world. Similar methods fostered either by the Government agencies or by commercial interests might be followed with rubber.

EVAPORATOR SCALES.

Chemical Treatment.

BY PROF. W. SCOTT, B.SC.

A CHEMICAL process for removing Scales from Evaporator tubes has been used at Ste. Madeleine (Trinidad) for two years with good results; and has been adopted by several other local factories. This process is described in detail below, with the hope that it may help to solve the scale problem of other factories faced with similar conditions.

Ordinary lime defecation is followed in the Raw house of the above factory, yet the scale from the fourth calandria of the Evaporators contains from 35-40 per cent. Calcium Sulphate in addition to Silicate and Phosphate.

Treatment with Caustic Soda, HCl or Ammonium Fluoride has little effect on this scale. Complete removal is, however, effected by boiling with a solution of Sodium Carbonate (Soda Ash) followed by dilute Hydrochloric Acid.

Various concentrations were experimented with; but no satisfactory results were obtained with solutions containing less than 12-14 per cent. Soda Ash. This is approximately the strength of solution used in Hawaii.

In Laboratory experiments with sections of tubes removed from the fourth calandrias, complete elimination of the scale was obtained on boiling for five hours with a 12 per cent. solution of Sodium Carbonate and then, for one hour with 0.25 per cent. HCl. Under factory conditions it was found possible to reduce the time of boiling with the Soda solution to three hours without impairing the efficiency of the treatment.

The equipment chemically cleaned every week-end includes the juice-heaters, two clear-juice pre-heaters and two Quadruple Effects of 18,000 and 16,000 sq. ft. H.S. respectively. One of the mill-tandems is stopped in advance of the other at the end of the week to facilitate the liquidation of the boiling-house. By the time the 2nd tandem finishes grinding, No. 1 Evaporator has been liquidated, washed, and the scale cracked by the effect of heat on the empty tubes. The Sodium Carbonate solution is pumped through the juice-heaters to the clear juice tank, thence to the Evaporator through the pre-heater. The juice-heaters and intermediate tanks should be quite free of juice. The Soda solution is practically at boiling point at entering the Evaporator. Water is next passed through the heaters and tanks, and is used in making up for the evaporation in the first body, thereby reducing mechanical losses of the Chemical. The make-up water for the other vessels is obtained from the individual water-inlet pipes.

A vacuum of about 20 inches is maintained on the last body in order to ensure brisk boiling and good circulation. Those conditions are considered necessary :

(1) to prevent the Soda solution from foaming.
(2) to loosen the scale.

At the end of three hours the Soda solution is concentrated and held in the last three vessels while the first vessel is filled with water to about twelve inches above the tube-sheet. This water is brought to boiling point while the Soda solution is being transferred to Evaporator No. 2. The water in the first vessel of No. 1 is passed in turn through each of the other vessels in order to recover as much of the Soda as possible, and is finally sent to No. 2 Evaporator. No. 1 Evaporator is then thoroughly washed, the acid solution (about 0.25 per cent. HCl) drawn in and boiled for one hour. This acid is ultimately transferred to No. 2, Evaporator where it is made up to strength with fresh acid.

The Soda solution after concentration is returned to the Storage tank. The first washings of No. 2 Evaporator are also returned to the Storage tank. The complete cycle of operations in this case requires from ten to eleven hours.

The following points should claim the special attention of the operator :—

1. Maintain a high rate of evaporation to prevent the solution from foaming over into the next calandria.
2. Wash thoroughly after boiling with the Soda solution otherwise part of the Acid will be neutralized.
3. Inspect the wash-out valves after each operation. An oversight will result in serious losses of chemicals.
4. Carefully remove all loose scale and slime from the bottom of each vessel before starting up. Trouble will otherwise be experienced with the strainer on the syrup outlet of the Evaporator.

The solution is made up to strength every week by the addition of Sodium Carbonate The efficiency of the solution will however diminish as the impurities accumulate. It has been found advisable to prepare a fresh solution after eight weeks; the old solution is used in cleaning the Vacuum Pans before being run to waste.

The cost of this process is somewhat higher than the combined acid and hand cleaning process, previously used. The difference in cost amounts to approximately thirty dollars per week, which is a trifling amount compared with the results obtained. No value has been placed so far on the extra megass consumed by the boilers. The points in favour of the chemical treatment at the factory under consideration are the following :—

1. *Release of Labour :—*
   Release of forty-five men who were employed in scraping and brushing twelve thousand tubes in the two Evaporators every week-end. With those additional men available there is no longer a shortage of labour for other necessary week-end work.
2. *Increased rate of Evaporation.*
   The average rate of evaporation has been increased over 30 per cent.

Taking the figures for crop 1924 when cleaning was done throughout by hand scrapers and brushes after boiling with acid; and those for Crop 1926 when the tubes were chemically cleaned we obtained the following comparison :—

	Average tons cane ground per hour.	Maceration % cane.	Density syrup Brix.
Crop 1924 ..	96.21	28.65	62.57
Crop 1926 ..	117.51	31.04	67.97

Owing to the heavier density of the syrup supplied to the Vacuum Pans, their capacity has been increased. A considerable surplus of Megass over the fuel requirements was obtained during crop 1926.

3. *Elimination of human element.*

The chemical treatment is under the supervision of a single individual and, provided all necessary precautions are observed, the results are practically certain. Very variable results were obtained from one week-end to the next when manual labour was employed. The Evaporators had often to be started with tubes of different degree of cleanliness, and would be a source of constant worry for the remainder of the week.

4. *Longer life of tubes.*

The chemical treatment described is quite harmless to the tubes or other metal surfaces. The acid used is very weak and remains in contact with the metal for a comparatively short time.

It should be mentioned here, that experiments were made, prior to the adoption of the chemical process, with steel brushes adapted to electric drilling outfits. A considerable amount of brass dust was separated from the pulverised scale, indicating a considerable wear of the metal of the tubes.

5. *Better condition of tube surface.*

After being chemically treated the surface of the tubes is left clean and smooth. Scrapers roughen the surface of the metal thereby encouraging the initial formation of scale.

Reference was made above to the treatment of the juice-heaters and pre-heaters with the Sodium Carbonate solution. After all traces of the latter have been removed, a very weak, acid solution is introduced in the heaters and left for 3-4 hours.

On opening the heaters the scale can be seen to hang loosely from the surface of the tubes. This scale is removed by a light brush, no scrapers being necessary.

In factories equipped with one Triple or Quadruple effect, the operations described above would be greatly simplified, and should be completed within six hours.

THE COTTON WORM IN 1926.

THE cotton worm of the West Indies, the larva of the moth *Alabama argillacea*, has been unusually abundant during the cotton growing season now coming to an end.

In St. Kitts, where cotton was planted in March, the young plants were attacked during April and from then on, till the cotton was ready for picking, one attack was followed by another. The season was a showery one and the applications of poison dust were frequently washed off as soon as they were put on, and a very unusually large amount of insecticide was used.

The same thing happened in other islands. In Montserrat where cotton was planted at the same time as in St. Kitts the cotton worm attack came at the same time; in Antigua, July planted cotton was attacked in August, and in St. Vincent the young cotton was attacked toward the end of July.

So far as known the cotton worm does not live in the West Indies from one season to another, and it is believed that the attacks of each season are the result of invasion of the moths by flight from South America. The attacks experienced in the several islands during 1926 indicate that there have been several of these invasions during the season.

The direction of flight of this moth so far as recorded is northward. At the end of the cotton growing season in the United States the moths fly away to the north and they have been seen in great numbers in the northern states and in Canada.

These flights have not been seen in the West Indies, but it is believed that the impulse to fly north from Brazil in the first instance and into Canada in the last instance will always be the flight impulse, that is, an impulse to fly to the north.

The spread of the insect from one island to a neighbouring island may sometimes occur, but a spread of this sort would not account for the appearance of the caterpillars in St. Vincent two or three months after the attack had begun in the northern islands, if the flight is in a northerly direction. In all the West Indian islands where cotton is grown the close season is carefully observed, the cultivated cotton being destroyed, and a campaign has been waged against wild and native cotton for several years. The cotton worm is not known to feed on any plant but cotton and it is not in the least likely that the insect is able to breed and develop in these islands except in the fields of cultivated cotton.

The persistent attacks of cotton worms in the several islands has resulted in complete depletion of the stocks of arsenicals and in the case of some of them the poisons were exhausted early and great anxiety for the safety of the crop has been caused.

The experience of the season should be a warning to planters to see to it that a full stock of poison is available before the next crop is planted.

QUEENSLAND COTTON.

Costs of Production.

MR. G. Evans, C.I.E., M.A., Director of Cotton Culture, Queensland, writing on "The Future of Cotton Growing in Queensland" in the *Empire Cotton Growing Review*, states that: "The costs of production is one of the points that is being carefully investigated, and the figures that it is hoped will shortly be available from the Cotton Experimental Farms, where accurate costs per acre are being worked out, should prove instructive.

The cost of bringing the crop to harvest varies with the class of land, season, and other factors. On scrub country the costs are different from those on forest land. "Scrub," it may be explained, is the term given to country covered with dense "rain forests," comprising various species of soft-wood trees with a thick undergrowth of bushes and shrubs. Forest land is open country with little or no undergrowth and covered with more or less scattered trees of hardwood varieties, mainly eucalypts.

The custom in the scrub country is to fell the timber and undergrowth in the winter months and then, when dry, to fire the whole. A crop is then sown by hand in the ashes between the charred stumps that remain. One of the favourite crops to be so planted is cotton. On certain classes of scrub soils excellent crops of cotton have been obtained which have gone a long way to place the new settler on his feet and have much more than paid the cost of clearing the land. The trouble is that in the second year he cannot plough out his cotton because of the stumps, and also he cannot usually afford to employ labour to help him to cut down and burn his bushes at the right time. The result is that the second year crops, especially near the coast and in a normal spring, get choked with weeds because no horse implements can be used to keep them down. The second year crop, therefore, may prove unprofitable to pick and be abandoned. Large areas of these abandoned ratoon cotton plots are seen in the scrub areas of the Central District, and they must inevitably serve as a breeding ground for pink boll worm and other pests. The real facts are just beginning to be appreciated by the growers, and it is a matter for consideration whether in the near future it will not be found better to plant the newly burnt scrub with maize or some other crop, or to put it down to Rhodes grass as a grazing paddock straight away. In any case it is the endeavour of the new settler to plant Rhodes grass eventually as a fodder for his dairy cows, and cotton is often only regarded as a means of covering expenses on the cost of felling and clearing the land, and of giving some profit as well during the difficult first year on a new holding.

Since the cost of felling and clearing is about 30s. to £2 per acre, and planting and thinning out comes to perhaps another 10s., the total cost of bringing the crop to harvest is not excessive, more especially as after a clean burn weeds do not cause trouble to the cotton in its first season. This method is interesting in that it is almost identical with that employed by certain primitive tribes in the jungles of various parts of India. The Gond and the Korku of the Central Provinces forests have their "dhaiya" cultivation for millets, and the natives of the Chittagong Hills practise "jhooming," in which they grow a very coarse short stapled variety of Assam cotton. After the second year, however, the clearing is abandoned to the weeds and bamboos and a new piece of forest is tackled.

It is likely that cotton in Queensland will in the future tend to be produced more and more on soil that has been brought under the plough, and it is therefore important to study the costs of production on this class of land. Various estimates have been made of the cost of bringing a crop to the harvesting stage. On an average, and for the purposes of estimation, £4 an acre may be taken as a fairly representative figure, if anything perhaps a shade on the low side. The yields vary greatly, both in accordance with the season and also with the methods of the individual grower. This year, for instance, on the Monal Creek Demonstration Farm on the Upper Burnett an average of nearly 1,500 lb. of seed cotton over twenty-one acres (some of which was late planted as an experiment and was severely damaged by the early frost) was obtained. The portion planted in October actually yielded at the rate of 2,200 lb. per acre. These figures are, of course, exceptional, and although several of the new settlers near this farm who adopted the farm methods obtained practically as good results, other districts, of course, did not fare so well. In some places the rains were not so favourable and the heat wave did more damage, whilst on other areas pink boll worm and boll rots were more pronounced. Of the area actually brought to harvest this year and not reckoning the abandoned areas, it is fairly safe to say that a crop of 700 lb. of seed cotton per acre was obtained as an average.

The cost of bringing this to rail head will be approximately as follows:—

	£	s.	d.
Cost of bringing an acre to harvest ..	4	0	0
Picking 700 pounds at 2d. per pound ..	5	16	8
Haulage, bags, picking, rent, &c. ..	1	1	6
Total	10	18	2

This latter item naturally varied in accordance with the distance from the railway, but the figure given above may be taken as an average.

This works out at 3.74*d.* per lb. of seed cotton or for the sake of ready reckoning 11.25*d.* per lb. in the lint, since the ginning percentage works out at somewhat less than 33 per cent. in actual practice.

The other charges have been estimated as follows by the Accountant to the Department of Agriculture and Stock, Queensland, and are based on the 1923-24 crop return, which was about 9,800 bales of 500 lb. each:

Estimated cost of putting One Pound of Lint on Liverpool Market:

	d.
1. Grower's cost of production.. ..	11.25
2. Inward cartage on seed cotton ..	0.0001
3. Inward freight on seed cotton ..	0.3298
4. Ginning and handling charges ..	1.25
5. Insurance land risk	0.0671
6. Wages of weighers and graders ..	0.1022
7. Postage	0.0068
8. Freight and other shipment charges, overseas expenses, and handling charges	1.9
9. Treasury interest	0.686
Total	15.592

It should be noted that items 2, 3, 4, 5, 6 and 7 are actual costs. Items 8 and 9 are estimates, since the final accounts have not yet quite been balanced, but they may be accepted as very nearly correct.

It will be noted that ginning and handling charges are rather high compared with other countries. This figure, however, is the rate allowed to the British Australian Cotton Association in their agreement with the local Government, which is not to terminate until the end of July 1926. No value has been placed on the cotton seed produced in this estimate. If this were done the costs under the head "ginning and handling charges" might possibly be materially reduced. In other countries the grower usually sets the value of his cotton seed against ginning costs. In Australia the value of cotton seed is as yet small, but may be expected to appreciate in the near future.

Items 7 and 8 seem to be high, and it should be possible to reduce these figures when the industry settles down and gets on to a better organized basis. At present there is a lot of delay after the cotton is ginned and before it reaches Liverpool. Again, a good deal of the crop was not disposed of until after it had been in Liverpool for several months. This, of course, partly accounts for the high interest charges."

OBITUARY.

MR. F. R. SHEPHERD, Agricultural Superintendent, St. Kitts, died of pneumonia on 7th October, after a very brief illness.

Mr. Shepherd, who had retired on pension on 30th September, had been associated with the Imperial Department of Agriculture from the time of its establishment, and he has taken a very important part in the development of the Sea Island Cotton industry in the Leeward Islands, and also in maintaining a high level of efficiency in the sugar-cane industry.

The many friends of Mr. Shepherd, and Agriculturists generally throughout the West Indies, will learn of his death with deepest regret.

SOIL AND MANURE.

The Rate of Cellulose Decomposition.

BY F. HARDY.

THE problem of the rate of decomposition of the cellulose components of plant residues (such as straw, sugar-cane trash, megass and wood sawdust), that may be added directly to soil as part of a manurial scheme, is of great importance in agriculture. Certain phases of the mechanism of cellulose decomposition as related to micro-organic activity have already been discussed in this Journal (*See* Vol. II, 1925, p. 108 and p. 121). One of the chief practical results that have been established is that fresh straw and the like are liable to affect adversely the accumulation of soil nitrate, at least for a considerable period of time after their application, and may therefore lead to temporarily depressed crop yields. Even when the plant residues are first converted into various forms of pen manure, the degree of cellulose decomposition that may have already been attained in the manure heap, may be of very variable magnitude. It is therefore of interest to discover by field and laboratory experimentation how rapidly cellulose break-down proceeds both in manure heap and in soil under prevailing circumstances.

Straw as Manure.

Recent work on the use of *straw* in a system of soil management carried out by Messrs. Thomas and Harper (*Soil Science*, 1926, XXI, p. 393) at the Iowa Experiment Station, U. S. A., has shown that oat straw added along with red clover (ploughed in), or with sodium nitrate, or ammonium sulphate respectively, did not appreciably hinder nitrate accumulation. The authors consequently recommend that straw, even in relatively large quantities, may be added to land bearing second-growth clover, without fear of nitrate depression, except in the soil immediately in contact with the straw. Presumably, a leguminous crop corrects the temporary depletion of nitrate due to the growth of cellulose organisms, and the same result may presumably be attained when a relatively quick-acting nitrogenous fertilizer is used in the *absence* of leguminous crop. Doubtless the efficacy of the substitution of fertilizer salt for leguminous crop largely depends on the particular soil-type concerned. (It is important always to consider the initial effect of added fertilizer *on the soil*, for certain soils, notably heavy impervious clays of high colloid content, may either prevent diffusion and distribution of dissolved fertilizer, or may react with the fertilizer compound, by a process of chemical exchange, so as to "fix" its essential component, and thus to prevent its gaining ready access to plant roots. This view of fertilizer action is not always borne in mind by practical agriculturists.) Thomas and Harper's results are further amplified by the researches of Messrs. Barthel and Bengtsson in Sweden (*Mitt. landw. Zentralverssants*, 1926, p. 1), who found that oat straw decomposes

more rapidly in loamy or sandy soil than do other types of cellulosic material such as sawdust. They explain this result as due to the fact that oat straw initially contains appreciable amounts of nitrogen which enables the cellulose-decomposing organisms to get to work quickly. Evidently, plant residues are specific in their composition and behaviour in soil.

Rate of Decomposition of Pen Manure.

Some recent experiments in Germany (M.Bach, *Landw. Vers.—Stat.*, 1926, p. 245) have demonstrated that approximately three-quarters of the carbon compounds in pen manure added to a variety of soils, both cropped and fallow, disappear within one year. The remaining one quarter is destroyed only very slowly. Decomposition was found to be notably more rapid in non-calcareous soils than in chalky soils. The lignin component of the cellulosic substances present in pen manure was found to be the most resistant, and the gummy, pentosan component, the most readily destroyed.

Nitrogen showed a considerable decrease soon after manuring, whilst phosphate remained constant, and potash showed only a gradual decline. In the two years following manuring, rye and sugar-beet were found to have utilized about 20 per cent. of the added nitrogen, 20 per cent. of the added phosphate, and 50 per cent. of the added potash. These data indicate that, whereas the carbonaceous part of pen manure may be destroyed in soil quite rapidly, the inorganic part may be yielded up only slowly. Presumably, therefore, the beneficial effect which the carbonaceous matter present in pen manure confers on soil-tilth may become inappreciable within a year, but the nutritive effects of the mineral matter may persist for much longer periods, provided it is suitably fixed in the soil and not too rapidly removed by drainage water.

It would be interesting to know if these results obtain for systems of pen-manuring in the tropics. For the information of those who desire to trace the fate of plant residues and pen-manures added to soils of different types, and growing different kinds of crops, the following methods of chemical examination may be recommended.

Determination of cellulose (Bengtsson's method).

A representative bulked sample of the plant material, manure or soil is dried and powdered. Suitable portions (10, 20 or 50 gr.) of the powdered material are digested at 100°C. for 72 hours with a solution of 80 gr. of sodium hydrogen sulphite in 100 cc. of water and 200 cc. of normal hydrochloric acid. The residue is washed and dried at 50°C. It is then shaken for 1 to 2 hours with 100 cc. of Schweitzer's reagent (an ammoniacal solution of cuprous hydroxide, which dissolves cellulose). The mixture is filtered next day. The cellulose in 50 cc. of the filtrate is precipitated with 80 per cent. alcohol, washed successively with hydrochloric acid, 5 per cent. ammonia, 2 per cent. hydrochloric acid, water, alcohol and ether. It is finally dried for half-an-hour at 50°C., and for one hour at 100°C. It is then transferred to a platinum or silica crucible, weighed, ignited and re-weighed. The difference between the two weighings gives the amount of cellulose in one half of the initial amount of material taken.—(*See Journ. Soc. Chem. Indus.*, Abstracts B., Aug. 6, 1926, p. 640.)

Determination of mineral matter.

The mineral matter in the material may be determined in another portion of the sample by the usual conventional methods of soil or plant-ash analysis.

In all cases, the results should be corrected for moisture contents if accurate values are desired.

PLANT GROWTH.

Effect of Handling.

M. A. BAILEY AND J. TEMPLETON have recently published "A Note on the Abnormal Behaviour of Cotton Plants when subjected to Handling" (*Min. of Agric. Egypt. Tech. and Scientific Service.* Bulletin No. 61, 1926.)

They report, and illustrate with photographs, a pronounced stunting of certain plants subject to daily examination in the preparation of flowering curves. For example, in one case the average height of 49 "observation" plants was 66.18 cm., whilst that of 30 adjacent plants not under daily observation was 128.8 cm. The yield of cotton does not appear to be affected to any serious extent, if at all.

From the facts that adjacent plants do not show the effect, and that the provision of duckboards round the plants does not prevent its appearance, the authors conclude that the stunting is not due to trampling of the soil around the observation plants, but is a direct response to handling, due to the irritability of the plants themselves.

This view is hardly acceptable without further proof. Physical shock, such as must be caused by handling, is known to affect growth-rate, but no case has ever been recorded (to the present writer's knowledge) of such a great effect as this.

It is stated that the stunting effect is much more noticeable in some cases than in others, but the variability of its incidence has not been connected with any particular climatic or soil conditions. But immediately after, it is noted that one of the clearest cases occurred in a low-lying field where unsatisfactory conditions of growth were indicated by high bud-shedding on all plants.

This, taken together with the fact that "it is necessary, if no flowers are to be missed, that the main stem of each plant should be pulled over to one side," suggests that the stunting is quite as likely to be due to injury to root-hairs by the pulling process as to "irritability."

However this may be, the observed facts remain, and are worthy of notice by all workers whose investigations involve frequent handling of their experimental plants.

E. E. C.

TROPICAL WORLD NOTES.

Trinidad and Tobago.

During 1925 the c.i.f. value of the total imports was £4,395,041 (31 per cent. from United Kingdom; 23 per cent. from Canada; 22 per cent. from United States of America), and the f.o.b. value of the exports, £5,170,355 (48 per cent. to the United Kingdom, 5 per cent. to Canada; 22 per cent. to the United States of America). Amongst the exports, crude and fuel petroleum (£1,155,496) petrol spirit (£345,170), and refined kerosene (£62,202) accounted for £1,562,868; cocoa for £1,462,723; sugar (£1,092,594), molasses (£29,639) and rum (£5,337) for £1,127,570. Amongst the minor products exported are coffee and rubber.

The reduction of cultivation of cocoa owing to low prices, together with unfavourable weather, contributed to a fall in production, the 49 million lb. produced being 7 million lb. below the figure for 1924 and 15 million lb. below that for 1923. Again the running out of estates was not offset by production from new plantations. The value, however, owing to better prices, was about £92,000 greater than in 1924.

Although the sugar crop was increased; 60,645 tons being exported, its value was £142,000 less than 1924 when 43,432 tons were exported. The export of molasses fell from 1½ to 1¼ million gallons, but the price realised was £29,639 as against £24,843; rum dropped back to nearly the same figures and values as in 1922 and 1923, the great improvement in 1924 not being maintained. The sugar crop for 1926 will be affected by a severe outbreak of the sugar-cane froghopper. The value of Angostura bitters exported was £75,734 as against £46,567 in 1924, whilst the amount increased from 46,569 gallons to 58,336. The total value of coconut products fell from £222,764 to £192,830.

Within the Forest Reserves there are now approximately 1,258 acres of plantations, over 90 per cent. of this area contains indigenous species, principally Cedar, Poui, Cypre and Balsam, the remainder being under exotics, principally Teak. Only one new plantation was formed during 1925, this being 13 acres of Teak; further 1-acre experiment plots were formed during the year, particular attention being paid to Cedar.

An experiment with air-seasoning of local timbers was commenced in 1925 and the results achieved show that with proper handling air-seasoned timber of good quality can be produced. The Forest Revenue amounted to £14,289 giving a surplus of £8,977 over expenditure.

At the end of 1925 there were nineteen companies with a total share capital of more than £14,000,000 actively engaged in the exploitation of oil in the Colony. The total quantity of oil produced was 153,327,745 gallons. The Royalty paid amounted to £40,099 and wayleaves to £10,901. 201,107 tons of Asphalt were produced having a value of approximately £125,692. — (*Colonial Report No.* 1311.)

Nigeria.

The completion of the eastern branch of the Nigerian Railway and the linking together of the Eastern and Western Systems is described by the Governor Sir Graeme Thomson, as "a most important land-mark in the history of the development of Nigeria." All Nigeria will benefit indirectly by the greater freedom of internal trade which will result. The first and most immediate benefit will be felt in Northern Nigeria, whose staple crops of cotton and ground-nuts will now have a second route to the coast, and the choice of two ports—Lagos and Port Harcourt—at the same cost for carriage. The annual congestion of railways and shipping caused by the simultaneous demand of the cotton and ground-nuts of the north, and of the cocoa and palm oil and kernels of the central and southern belts for the single line, and the only port, will be relieved by the diversion of the northern crop traffic to the eastern line, leaving the western line and port free to the central and southern traffic. The expansion of the Northern Provinces, which was checked by production having overtaken the means of marketing its produce, can be resumed when the industry of growers and the enterprise of shippers are no longer discouraged by having a portion of the crops left to deteriorate in their hands while waiting for transport. The growers and shippers of the forest belt will have the uninterrupted services of the branch of the railway running through their area and of its natural port, no longer congested with northern produce competing for tonnage. "Unlike many parts of Nigeria, where pack animals have enabled a considerable volume of trade in cotton and ground-nuts to develop, the country penetrated by the Eastern Railway lies entirely in the tsetse-infested country, so that the only means of transport possible have been by head-porterage and by water. The former involves a great waste of productive labour, while the latter, owing to the nature of the country, has been strictly limited in its application. All this is now altered, and thousands of square miles are thus added to the productive area of Nigeria from the point of view of internal and external trade. Oil-palms, cotton, beniseed, ground-nuts, and ginger are all already grown along the line of the new railway. The culture of these valuable products of world commerce will now receive a stimulus which could have been given in no other way."

An influence, almost as powerful as the tsetse fly, in retarding the development of these densely populated districts has been the peculiar nature of their soil. Though rich in oil-palms, the soil available for growing foodstuffs is very poor, consequently food is very dear, and the supply has to be supplemented from foreign sources. The annual import of rice alone is valued at £100,000. The districts to the north, beyond the tsetse belt, will now be able to enrich themselves and benefit the people of the palm belt by growing food, to be carried by the railway to the producers of palm oil and kernels, enabling the latter to devote themselves to the increase of their production of these

West African staples. "When this takes place it will be possible to develop the palm groves on a much more economic and intensive basis, because each zone of the country will be producing that for which it is best adapted by nature instead of each community existing as a separate, self-centered and self-supporting unit in a struggle for existence in which the division of labour is one of the most elementary laws of economic success." (Sir Graeme Thomson).—*The African World*, Vol. LXXVII, No. 19, p. 25.

Gold Coast.

In the course of his recent address to the Legislative Council, when presenting estimates of revenue and expenditure for the year 1926-27, His Excellency the Governor of the Gold Coast, referred to the growth of the import and export trade of the Colony, which for last year was more than double the tonnage of that in any year prior to 1922. An increase in trade naturally means an increase in the spending power of the people, and he pointed out that there were many signs that this had been the case.

In 1925 the people of the Gold Coast spent over £1,500,000 more on the purchase of imports than they did in the previous year. This in itself was a sign of increased prosperity that could not be misunderstood; while another sign to which he attached definite importance was the number of well constructed concrete dwellings which were being erected throughout the Colony, and the large number of new shops and offices which were being put up by business firms, both European and African. This erection of new business premises was not only a sign of to-day's prosperity, but was a significant indication of the opinion of business men with regard to the future trade of the country.—*Chamber of Commerce Journal.*

Cayman Islands.

The report of the Commissioner of the Cayman Islands (Jamaica) for the past year, which has just been issued, states that the imports for the year (£42,663) are below the average of the previous five years, but if the inflated years 1921-22 are ignored, about normal. The exports (£14,813) are substantially above the normal average for the previous half decade, all but £2,500 being from the turtle fishery.

The catch of green turtle, returned as 3,000 of merchantable size, and the price obtained (£2 each), were both better in numbers and value than in 1924. The hawks-bill fishers were also more successful than in 1924, the catch weighing 3,952 lb. at an average value of £1 8s. per pound, as compared with 3,419 lb. and a rate of £1 7s. 9d. in the previous year.

The export of thatch-palm rope increased from £640 in 1924 to £1,754 in the year under review. This small industry provides an aid to livelihood to many who, being without a vigorous bread-winner, would otherwise be unable to maintain themselves.—*The Canadian Gazette.*

British Honduras.

During the past year, heavy rains have proved an aid to production in British Honduras. They have facilitated the floating of mahogany logs down the rivers—in some cases logs stranded for years have been got out—and increased the production of chicle, as the sapodilla tree gives larger quantities of latex in wet than in dry seasons. Trade again shows an improvement. Mahogany and chicle exports continue to be the mainstay of the Colony, being responsible together, in about equal proportions, for 79 per cent. of the total exports; 12,580,836 square feet of mahogany, valued at $1,403,009, of which 9,400,234 square feet were of domestic produce, and 3,022,196 lb. of chicle, valued at $1,435,998, of which 334,892 lb. were of domestic produce, were exported during 1925. 78.64 per cent. of the exports went to the United States of America. The total value of the imports was $4,575,121, of which 50 per cent. were from the United States of America, and 17 per cent. from the United Kingdom and 11 per cent. from Canada.

British Honduras is one of the tropical lands where agriculture takes a back place, its position being illustrated by the following analysis of exports of domestic produce in 1925.

	Percentage.
Forest Produce	78.9
Agricultural Produce	18.6
Marine Produce	2.5

Since its formation in 1922, the Forestry Department has made progress with a rapidity exceeding expectations.

Afforestation work is being carried out at six centres in different parts of the Crown lands, and an extensive area of forest land has been topographically surveyed, whilst examination of practically untrodden territory adjacent to the western border between Vaca and the Rio Grande is in progress.

Beneficial results are awaited from three concessions that have been negotiated—one for the extraction of so-called secondary woods; another for opening up the hitherto inaccesible mahogany forests in the hinterland, and a third for the development of the pine industry on Crown Lands.

Forest legislation has been drafted and the framework of a sound system of forest administration and finance established.

The chief agricultural industry at the present time is the cultivation of coconuts. The banana industry is on the decline owing to Panama disease. Sugar is produced on a small scale but there is a large acreage of land excellently suited for sugar growing and a central factory should be a profitable undertaking. Labour supply is the only difficult factor.—(*Colonial Report* No. 1308.)

A CABLE from Cairo states that the Cabinet has decided to issue a Decree limiting the acreage of the cotton country to two-thirds of the present area for three years. Owing to the large American cotton crop, Egypt is stated to be in the midst of a grave economic crisis.

BANANAS.

IN 1867, the value of all the fruit exported from Jamaica was only £728; in 1924, the value of exported bananas alone reached £1,225,000—the value for the previous year being £2,265,309—and in the shipping of these, the following table shows that the leading place in the trade was taken by the United Fruit Company.

	Bunches.
United Fruit Co. (including shipments of Elders & Fyffes) ..	5,000,000
Atlantic Fruit Co.	3,000,000
Jamaica Fruit & Shipping Co. ..	2,300,000
Tropical Fruit Co.	680,090
Miscellaneous	990,000
	11,970,000

—(From Aspinall: *Handbook B.W.I.* p. 91).

United Fruit Company.

In an article—"Caribbean Tropics in Commercial Development" contributed to *Economic Geography* (Vol. II, No. 4, pp. 494-507) by Mr. V. M. Cutter, President of the United Fruit Company—an account is given of the work of the Company with particular reference to the cultivation and distribution of bananas.

The claim of the Company to be "the greatest farmer in the world" receives substantial support from the following tables which are built up from figures given in the article.

	Acreage.	*Value.*
Land owned	1,615,000	
Land leased	219,000	
Total acreage ..	1,834,000	$15,730,840

Located in Colombia, Costa Rica, Cuba, Guatemala, Honduras, Jamaica, Nicaragua, Panama, and the Canary Islands.

Crop.	*Acreage.*
Banana	172,000
Sugar-cane	90,000
Cocoa	50,000
Coconuts	9,000
Other tropical products	4,000
Intensively cultivated	325,000
Awaiting development	1,201,625

An account of the gathering and marketing of the banana follows a description of its cultivation. Each section of a plantation is usually gone over twice a week so that the overseer has a fairly accurate idea of the number of stems which can be cut on a given day in each section. Consequently, on receiving news as to the cargo requirements of a ship, he can provide that cargo quickly. As cut, each bunch is carried to the nearest tramline, which is connected with a main line, where trains pick up the fruit at assembly points and move it to the sea ports. The land transport system involved, as will be seen from the following table, is extensive.

	Miles.	*Engines.*	*Cars.*
Railway ..	1,541	187	5,320
Tramway ..	722	22	1,859

The bananas are never gathered ripened, but are cut green and ripened slowly. The stage of development which they are allowed to reach before being gathered naturally varies with the distance they have to travel before reaching the consumer—those to be sent to America are allowed to reach a later stage than those consigned to Europe.

The following table gives an idea of the time taken by bananas from Central America and Jamaica to reach their destination:—

	In days.
New Orleans	3- 5
Mobile	
Galveston	
Boston	7- 8
New York	
Philadelphia	
Baltimore	
Great Britain and Continent ..	15-16

Before loading, damaged bananas and those showing any trace of yellow colour are rejected. The fruit is then loaded by conveyor and stored in pre-cooled holds, resting on the butt of the stem and arranged in from one to four tiers. In order to ensure good ventilation and a low temperature range, special types of ship are necessary. These have several decks separated by vertical partitions into compartments and bins. The bins are constructed of wooden bars called "shifting boards" which keep the fruit from being crushed. On account of the great amount of heat given off by stored bananas, the refigerating apparatus must contend not only with the natural heat of the fruit as it is loaded, but also with that generated during the voyage.

In transit, the fruit is inspected at hourly intervals and a close watch is kept over the temperature. In winter, when Steamships are approaching the north Atlantic ports, it is sometimes necessary to resort to artificial heating to maintain the desired temperature.

The shipping of the bananas—during the last ten years 14,000,000 tons have been cleared—necessitates a specialised sea transport system of considerable size and the United Fruit Company owns the "Great White Fleet," made up as follows:—

American Fleet	38
British Fleet (Elders & Fyffes Line) ..	28
Chartered	27
Total	93

On land, the bananas are transported by refrigerator cars equipped with stalled floors providing an air space of from four to six inches under the load. During the summer season, the cars are usually iced, whilst in winter they are covered inside with heavy paper, and sometimes trusses of straw are placed between the fruit and the side of the car. In emergencies, cars can be switched into large heating plants at various points en route, and the fruit can be warmed to the required temperature. In America the marketing of bananas is in charge of the Fruit Despatch Company—a subsidiary of the United Fruit Company—the branches of which solicit and receive orders from the jobbers in their respective territories. An important function performed by the jobber is the ripening of the fruit. This demands a plant providing for fresh air circulation and the maintenance of the required temperature together with the proper percentage of humidity.

Throughout England, bananas are properly ripened, cut up into hands and packed into boxes which are transported by motor truck to the dealers in the small cities and towns. This method of handling bananas is known as the "flatting system," and is used not only in Great Britain, but with equal success on the Continent. It is relevant here to refer to the observations contained in the Third Report of the Imperial Economic Committee (summarised in *Tropical Agriculture*, Vol. III No. 8, pp. 163-5). The Committee, whilst recognizing the benefit conferred on the Island by the United Fruit Company's well equipped estates, attention to water supplies and so on; feels that the banana trade has drifted into channels not wholly advantageous to the Empire. British (Jamaican) supplies go largely to foreign markets, whilst the United Kingdom market is almost entirely dependent on foreign supplies.

The marketing of Jamaican bananas in the United Kingdom was started by Messrs. Elder Dempster, a line subsidised in 1900 by His Majesty's Government. However, in order to maintain the guaranteed supplies, the British Company had to fall back on the United Fruit Company, and, since 1903, the latter has held a virtual monopoly of supplies in the United Kingdom. Now, the marketing of bananas in Europe is under the control of Messrs. Elders and Fyffes, over 99 per cent. of whose shares are held in the United States, and over 83 per cent. by the United Fruit Company.

In Mr. Cutter's article, reference is made to the work of the Medical Department and this shows that the United Fruit Company has adopted an enlightened and advanced policy with regard to the maintenance of the health of its employees. It is claimed that in the districts where the Company operates, the health records now compare favourably with those of communities of equal size in the temperate zone.

A STOCK FOR THE MANGOSTEEN.

MR. P. J. WESTER, writing in *Science*, 3rd September, 1926, states the following with regard to the grafting of the Mangosteen.

"On the hacienda of Mr. John R. Schultz, Calauan, Laguna, Philippine Islands, in May, 1924, I inarched a seedling of the mangosteen, *Garcinia mangostana* L., on a plant of a native species of *Garcinia*, locally called *Bunag*. A successful union was rapidly established, and the grafted plant had made a good start when last I saw it shortly before leaving Manila for the United States in January, 1925. Photographs recently received from Mr. A. W. Prautch, Bureau of Agriculture, Manila, show that the plant now reaches to a man's hips and is in excellent condition.

The success obtained in this graft is of more than ordinary interest in view of the fact that for a period of some 25 years attempts repeatedly have been made to graft the mangosteen on more than twenty species of *Garcinia* and related plants, all, except the instance recorded, ending in failure.

The mangosteen is one of the most highly prized fruits in the world, but is particular in its climatic requirements, has a weak root system, and is of very slow growth, especially in the nursery stage. Therefore, unlike many other fruits, the mango, for instance, the mangosteen has never become widely disseminated, and still is grown on a comparatively restricted area and in small quantities, notwithstanding its unsurpassed eating qualities and good shipping qualities.

The *Bunag* not only is a plant of vigorous growth which may be expected to force the grafted plants into bearing several years in advance of mangosteens grown on its own roots, but it thrives exposed to a dry long season. Therefore, by the use of *Bunag* as a stock, it would appear feasible to extend the culture of the mangosteen over large areas where for climatic reasons this hitherto has been impossible."

ESTIMATES of the damage done to the cane crop in Cuba by the recent hurricane vary between fifty per cent. and fifteen per cent. on various estates. The damage in the three province is estimated at between twenty and twenty-five per cent., involving a loss in sugars of from two hundred and thirteen thousand to two hundred and sixty-five thousand tons. The Department of Agriculture is surveying the storm area in order to ascertain the exact amount of damage done. It is expected that seventy-five per cent. of the mills damaged will be grinding by 15th January.

THE IMPERIAL CONFERENCE.

GREAT BRITAIN has long been an industrial country, and, at the same time, a specialised centre of that great agricultural unit, the British Empire. This division of labour has aided the economic development of Britain and the Colonies, and has been beneficial to both.

The Imperial Conferences, begun in 1887, consolidated the previous economic tie and provided a mechanism for common action within the Empire. These Conferences did not include India till 1918; and, only in 1925 did the Colonial Under-Secretary for the Colonies represent the interests of the British Tropics at the Imperial Conference.

At present the potentialities of the Empire are being vividly realised, and attention is being paid to the fascinating economic and political problems which are raised.

During the Imperial Conference which opened on Tuesday, 9th October, large issues of policy concerning the relations of Imperial partnership took a prominent part in the well laden agenda, but, naturally, those communities controlled from Downing Street were not ignored, and the Conference was truly Imperial. On Thursday, 21st October, the Secretary for Dominion Affairs, the Rt. Hon. L. S. Amery, gave an exhaustive survey of the position in the Colonial Empire and the Prime Ministers of Australia, New Zealand and South Africa reported on the mandated territories. To prevent the Conference from becoming a mere debating assembly, Committees were appointed, and these dealt with a wide range of matters. For example, the Economic Sub-Committee (under the Chairmanship of Sir Sidney Chapman, Permanent Secretary to the Board of Trade) considered the questions of the development and improvement of the system of collection of Empire Statistics, of methods of improving the distribution of commercial intelligence, of statistics of stocks of wool and of food in cold storage, &c. Amongst the other sub-committees were those on Overseas Settlement, Research and Forestry.

On 21st October the Conference turned its attention to activities from which the most direct and important results may be expected to flow. Sir Philip Cunliffe-Lister, President of the Board of Trade, in opening, stated that in 1913 the Empire proportion of British imports was 24·87 per cent. In the last twelve months the proportion had risen to 31 per cent. In 1913 the Empire took about 37 per cent. of British exports; in the last twelve months the Empire took about 42 per cent. There had also been an increase in inter-imperial trade.

One also gathers that since the last Conference, the Imperial Economic Committee has proved that the possibilities of co-operation in Empire development are far from being begun and ended with the establishment of a system of tariff preferences. The Imperial Economic Committee has presented four reports of importance dealing with aspects of the marketing of Empire Produce; the Imperial Shipping Committee has brought about improved transport facilities of all kinds, whilst the Imperial Institute has been re-organised and its educational work increased in scope by amalgamation with the Imperial Mineral Resources Bureau. Great progress has also been made in inter-imperial research work, and an Imperial Forestry Institute has been established at Oxford.

Mr. Amery paid most of his attention to the organisation and work of the Empire Marketing Board, which, with an annual grant of a million, was established to compensate for the failure of the British Government to carry out in full the system of preferences laid down at the last Imperial Conference.—"We calculated what would have been the equivalent value to the Empire of the preferences if they had been put into force, and we decided that this amount should be devoted through a fund to the furtherance of the marketing of Empire produce."

Two-thirds of the Government grant have been devoted to effective publicity in order to create "voluntary preference." The Board has also promoted research into a number of problems. On the advertising side it was deemed advisable not to rush into any detailed advertising campaign, but to provide a back-ground for such a campaign by urging the advantages of purchasing Empire goods rather than foreign goods, and that campaign is now being set in train. Some £40,000 is to be devoted to improving the marketing of home agricultural produce in the home market. On the other side, Mr. Amery pointed to the admirable work being done in cold storage problems by the Low Temperature Research Station at Cambridge, and in tropical and sub-tropical agriculture by the Imperial College of Tropical Agriculture at Trinidad, to which they had been able to allocate £21,000, additional to an equal sum from the cotton interests. He also hoped to give some help to the Amani Institute.

At the fifth meeting, Mr. Amery reviewed the position of the colonies, protectorates and mandated territories. The total trade of the colonies was put at over £500,000,000, and an idea of the growth of the trade is got from the following figures:

Trade of United Kingdom with Colonies.

Year.	*Imports.*	*Exports.*
1905	19,500,000	18,000,000
1913	40,000,000	47,000,000
1925	81,000,000	60,000,000

In a short survey of the main portions of the Colonial Empire, he stated that for various reasons, one of which was their individual isolation, the West Indian Islands during the greater part of the last century were in a state of stagnation and backwardness. Since the last meeting of the Conference, he thought the outstanding feature of their history was the meeting of a West Indian Conference in London last summer, whilst another important event was the Conference on Trade and Shipping, which was held with the Government of the Dominion of Canada at Ottawa in 1925.

The tsetse fly, the ravages of which extend across the whole continent from Gambia to Zululand, is holding up the progress of Tropical Africa. No lasting results can be obtained until that pest is controlled. Other questions are native health and native education, and a type of education more suited to their mental aptitude is being substituted for a purely literary education.

West Africa is unsuited to Europeans, but, fortunately, the native is commercially minded. This will be seen from the development of the cocoa industry. Beginning less than twenty years ago from nothing, it is at present the biggest cocoa industry in the world and produces the bulk of the world's cocoa.

East Africa is now a compact territory, and His Majesty's Government decided at the end of last year to guarantee a loan of £10,000,000 for the development of transport—railways, harbours, and roads—the loans to be raised by the various governments concerned. The Federated Malay States and Singapore give an instance of indirect government maintained to its fullest extent; being still administered under the authority and control of the native Sultans aided by British officials. Hong Kong, a barren rock seventy years ago, has become the largest in-and-out shipping port of the world and its prosperity was unexampled up to the outbreak of the anti-foreign troubles which swept through China and especially Southern China. In the middle East, the political position is being eased by the Arabs recognising that the influx of Jewish capital and Jewish settlers has contributed equally to the growth and prosperity of the Arab. With regard to Irak, Mr. Amery thought that once the frontier question was settled, that Kingdom would enter on a period of prosperous development. It has great natural resources and with irrigation works should prove greater and richer than Egypt.

Succeeding days were devoted to the discussion of imperial airways and imperial defence, whilst good work was done on specific problems by the committees and sub-committees.

From the words of the representatives, one gathers that the Dominions are inspired with a real determination to do everything in their power to help the mother country to strengthen her hold upon their markets and to increase her ratio of their trade. Miracles of course are not expected to result from the words spoken at the Conference, but we look forward to action upon definite lines.

POST WANTED

In the West Indies as planter or engineer, applicant aged 40, single, 15 years' engineering experience ashore and afloat (chief engineer's certificate) one year farming, war service. Communications to be sent to George Aitken, Craigmarloch, Yoker, Dumbartonshire, Scotland.

EMPIRE COTTON.

A difficult Phase.

AT a meeting of the Administrative Council of the Empire Cotton Growing Corporation, held recently in London, the President, Lord Derby, referred to the fact that Empire cotton growing was going through what was possibly a critical phase. The large American crop of the present season had reduced prices to a level which could not have been foreseen a few years ago. Though this fact might cause a setback in the acreage under cotton in the Empire, he thought that, nevertheless, where cotton was grown by natives on small plantations, this setback might not be prolonged.

The need for a money-producing crop was becoming increasingly felt by African natives, and they might learn from the drop in price that only improved methods of cultivation could ensure to them a sufficiently high yield per acre to bring them a good return for their labours.

In South Africa and Southern Rhodesia climatic conditions had combined with the low prices to make the season an exceptionally difficult one, but it should be possible for them to grow cotton with at least as good a chance of profit as farmers in the cotton belt of the United States, provided that they organised their farming on sound economic lines, and that they did not relax their efforts to produce the best cotton possible so as to continue to secure a satisfactory premium on their produce over middling American. He emphasized the advantages which Lancashire might expect to derive from their continued support and encouragement of the cotton-growing industry within the Empire.

At the conclusion of the Council meeting, the Hon. W. G. A. Ormsby-Gore, Under-Secretary of State for the Colonies, gave an account of his recent tour in West Africa, including the important cotton-growing area of Nigeria.—*The Board of Trade Journal, p.* 475.

THE sugar crop of Trinidad for 1926 is stated to have been 73,561 tons, a total which has only once been exceeded in 1887 when 79,010 tons were made. Of this amount 39,489 tons were made from estate canes, the remainder being manufactured from canes purchased from cane farmers. The total amount paid to farmers amounted to $1,093,770 ($1.00=4s. 2*d.*) During the year 13,492 East Indians and 9,447 West Indians were engaged in the cane farming industry.

Trinidad has recently concluded a successful British Shopping Week.

A joint committee of the Chamber of Commerce and the Agricultural Society is considering the question of banana and fruit cultivation in the light of the recommendations of the fruit section of the Economic Committee with a view to deciding whether the time is ripe for the formation of a Fruit Growers' Association.

CHEMICAL NOTES.

Compiled by the College Department of Chemistry and Soil Science.

Research on Lime-burning.

Lime-burning was one of the first industries, involving chemical reactions, to be practised by man. The Romans used lime-containing mortars in their buildings. Although such an ancient industry, there are apparently many unsolved problems of lime-burning, and further research is still needed to settle them. In an article by Dr. W. A. Gilkey, of Stanford University, California (*Indus. Engin. Chem.*, July, 1926, p. 727), the fundamental question of the rate at which powdered limestone should be passed through a calcining furnace so as to give the greatest yield of quick-lime, is discussed.

Dr. Gilkey conducted some 450 experiments on lime-burning in crucibles. His results are expressed in graphs, which clearly show that the rate of calcination varies greatly for different furnace temperatures, and for different concentrations of carbon dioxide in the furnace atmosphere. Carbon dioxide is one of the products of lime-burning, and, if not removed as soon as liberated, it may seriously retard the continued decomposition of the limestone.

The decomposition of limestone on heating is preceded by decrepitation, or mechanical disintegration of the linestone fragments due to unequal expansion. Dr. Gilkey demonstrated that decrepitation begins at about 570°C. and is complete in 10 minutes at 650°C. At this temperature, however, decrepitation is unaccompanied by calcination. Calcination becomes rapid at about 700°C., and is immeasurably rapid at 1000°C.

Starch Reserves in Tropical Plants.

V. Lubimenko's experiments, described in the French Journal, *Comptes Rendus de l' Académie des Sciences*, Vol. 182, p. 651, 1926, indicate that starch-reserves, formed in the parenchymatous tissue of leaves, may be completely depleted during the night in certain plants growing in latitudes south of 50°N. Partial depletion may occur even during the day. On the other hand, in latitudes north of 60°N., starch-reserves are usually *not* depleted during the night.

Some southern plants exhibit a maximum starch reserve at about mid-day, and a minimum reserve at night; for example, the tobacco plant (*Nicotiana tabacum*). Other southern plants exhibit two maxima and two minima on bright sunlit days; for example, *Phaseolus vulgaris*. Others again, exhibit a number of maxima and minima; for example, *Robinia pseudoacacia*.

These differences between southern and northern plants may exercise profound influence on growth process.—(*Journ. Chem. Soc., Abstr.* June, 1926, p. 647.)

Ternary Fertilizer Mixtures.

The recent manufacture of fixed-nitrogenous and phosphatic fertilizers by the volatization method, promises to provide means for making many new high grade fertilizer materials. Compounds containing two fertilizer ingredients, such as potash and nitrate in "Nitrapo," have long been known to the trade, but in the near future, complex compounds containing all three fundamental elements may become common. Such a compound is potassium ammonium phosphate $KNH_4(H_2PO_4)_2$. Fertilizer dealers may find difficulty in mixing these complex compounds so as to produce a material containing any prescribed proportion of potash, nitrogen and phosphate. They will find much help in two articles on the subject recently published in the United States. The first article was written by Messrs. Merz and Ross (*Bulletin* 1280, U.S. Dept. Agric. 1924), and the second, by Mr. B. Colbjorsen (*Indus. Engin. Chem.*, July, 1926, p. 724). Herein are described an algebraic method of calculation (which however, is rather laborious), and a simpler geometrical method, involving the use of triangular co-ordinates.

The Determination of Uncombined Lime in Cements and other Limestone Products.

None of the methods so far proposed get over the difficulty that lime in combination with silica and alumina in cements, &c., is readily hydrolysed by aqueous solutions. The subject is critically considered by Messrs. W. Lerch and R. H. Bogue of the United States Bureau of Standards in an article that appeared in *Industrial and Engineering Chemistry* for July, 1926. After reviewing the numerous methods that have formerly been elaborated, Lerch and Bogue select anhydrous alcohol mixed with one-fifth of its volume of anhydrous glycerine and a few drops of the indicator, phenolphthalein, as reagent. This is heated with a known weight of the material to be examined, and the residual solution titrated hot with standard ammonium acetate solution, until just sufficient standard solution has been added to destroy the pink colour. From the results the percentage of free lime can readily be calculated.

Cellulose Varnish.

Nitro-cellulose, dissolved in an appropriate solvent, is nowadays being increasingly used for varnishing motor-car and carriage bodies. The surface is degreased and rubbed down, and then given two coats of the varnish. Holes are filled with a special cellulose stopping, and two finishing coats of cellulose varnish are then applied. When the coats have thoroughly hardened, they are rubbed down wet, and a brilliant surface given by a final polishing. A carriage can be painted with cellulose varnish in 14 hours, whereas oil varnishing requires 366 hours work. The surface is hard, and is unaffected by oil, petrol or tar. Its appearance is easily restored by polishing.

BOOK REVIEWS.

HANDBOOK TO BRITISH MALAYA.—Published by authority and compiled by Captain R. L. German, Malayan Civil Service. Waterlow & Sons, Ltd., London Wall, London.

A useful and instructive handbook which is in many ways a great improvement over the usual Gazeteer.

An interesting account is given of the history of the British in Malaya and other chapters are devoted to a description of the many sided activities of the various Government Departments.

The chapter on administration is particularly instructive since it describes clearly the somewhat complicated system whereby the Straits Settlements and the Unfederated States are loosely but apparently effectively knit together for administrative purposes. The chapter on agriculture is of value and brings out clearly the great variety of crops that can be produced under Malayan conditions. It is to be hoped, however, that in a later edition more care will be taken with the scientific names of the various crops. In some cases both the specific as well as the generic name is honoured with a capital letter; in others neither is so dignified. One cannot help thinking also that a somewhat fuller description of the methods of cultivation of the main crops such as rubber, coconuts, and rice might have been given. One would like to see a brief account of the most suitable types of soils, elevations, and rainfall given for the two first mentioned plantation crops, and brief mentions made of the best methods of spacing and manuring that have been evolved as the result of experimental work.

The book is beautifully and copiously illustrated with photographs and considering the low price at which it is sold, is a remarkable production.

It should serve its purpose which is presumably to attract attention to the great possibilities that undoubtedly exist in a portion of the British Empire that is not so well known as it deserves to be.

G.E.

"FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY," by Charles Moureu (Translation from the 6th French edition), London, G. Bell and Sons, Ltd., 1926, 12s. 6d.

Students of chemistry who wish to acquire a broad idea of the relationships of the main types of organic compounds that have so far been described, will welcome this book, because of its novel method of arrangement and presentation. In an introduction, Sir William Pope, Professor of Chemistry at the University of Cambridge, writes, "Organic Chemistry is but in its infancy; it retains amongst its secrets all the mechanism of animal and vegetable life; biology, physiology and pathology would have no future were it not certain that they will expand upon chemical lines." "The classification of so detailed a subject (as Organic Chemistry), and the order in which each section of the science is laid before the student, become of prime importance." "A certain tendency towards uniformity of treatment (of Organic Chemistry) is observable in modern English textbooks. In English books it is not customary (for example) to discuss the aromatic hydrocarbons immediately after the aliphatic hydrocarbons, as does the author; such a mode of treatment appears, however, in many ways eminently logical. In this, and in many other directions, Professor Moureu breaks away from time-honoured traditions of method."

In this book, certain fundamental chemical conceptions are discussed in the separate sections of Chapter I (pp. 1-112); for example, atomic theory, isomerism, valency, homology, stereochemistry, relations between physical properties and structure, reaction-mechanisms equilibria and chemical affinity. In Chapter II, the hydrocarbons are described; in Chapter III, functions containing oxygen are treated together; and in Chapter IV, functions containing nitrogen. Chapter V is devoted to organo-mineral compounds, Chapter VI to heterocyclic compounds, and the last Chapter (VII), to dyestuffs. By these means, relationships are stressed, and undue attention to details of individual behaviour is avoided. The book thus becomes a review of classification rather than a catalogue of properties and methods of preparation. Used in conjunction with standard text books of practical organic chemistry, and with dictionaries of organic compounds, Professor Moureu's book furnishes a long-felt want, and its value can scarcely be over-estimated.

F. HARDY.

PHYSICAL CHEMISTRY, ITS BEARING ON BIOLOGY AND MEDICINE.—By J. C. Philip, London, Edward Arnold, 1925, Third Edition, 8s. 6d.

This book furnishes a most useful introduction to the application of physico-chemical ideas to problems of plant and animal physiology. For those who wish to gain a mechanistic insight into the processes that go on in living organisms, the viewpoint of the modern physical chemist is perhaps the most satisfying that can be offered. This book aims at presenting the subject to those who have only an ordinary acquaintance with physics and chemistry, but it is supplemented by many references to original papers. Such topics as osmotic pressure, permeability of membranes, electrolytic dissociation, the properties of colloidal solutions, adsorption, and the significance of hydrogen-ion concentration (all having intimate bearing on many of the fundamental phenomena of life processes) are clearly and adequately presented. Considering the size of the book, the ground covered is remarkably broad. We know of no other book which supplies a long-felt need so satisfactorily as this one, and we have no hesitation in recommending it to students of pyhsiology and ecology.

F. HARDY.

COLLEGE NEWS.

Professor C. Y. Shephard returned from England on the 6th November by the s.s. *Cavina*.

Mr. A. G. Howell, Registrar, and Mrs. Howell, returned from England on the 20th November by the s.s. *Ariguani*.

Professor J. S. Dash, accompanied by Mrs. Dash and children returned from England on the 30th October by the s.s. *Van Rensselaer*.

Mr. R. E. Hunter, B.Sc., lecturer in Botany arrived on the 20th November by the s.s. *Ariguani*. Mr. Hunter was Demonstrator in Botany, Department of Agriculture, University of Leeds.

Mr. A. L. Baker, B.Sc., lecturer in Agriculture, arrived in Trinidad on the 6th November by the s.s. *Cavina*. Mr. Baker was Assistant to the Advisory Agricultural Economist, Reading University.

Dr. R. H. Hurst, lecturer in Chemistry for sugar, and Mr. G. Wright, B. Com., lecturer in Economics, arrived on the 1st November by the s.s. *Ingoma*. Dr. Hurst was Research Assistant to Dr. Ramsden Johnston, Professor of Bio-Chemistry at the University of Liverpool. Mr. Wright was Assistant in the Library, University of Leeds.

Dr. H. Martin Leake, the Principal of the Imperial College of Tropical Agriculture, sailed by the s.s. *Ariguani* on Saturday, 20th November on six months' leave. He is travelling the longer way home in order to get in touch with the latest developments with regard to the banana industry, particularly on the research side of the subject, and hopes, therefore, to meet people interested in the fruit trade both at Colon, and in Costa Rica, and Jamaica, and to see something of the actual plantation conditions.

His departure on leave was made the occasion of a pleasant function at the College on Thursday afternoon, the 18th November, when the members of the College Staff were at home to the students and a few friends. The College Association Football team played the Trinidad Constabulary and managed to win 3-2 after an exciting struggle. An interesting interlude in the proceedings occurred at half time when Mr. A. E. W. Sheffield, on behalf of certain of the students, presented a silver christening mug to the infant son of Dr. and Mrs. Leake.

The members of the Parliamentary Commission recently appointed by the Secretary of State for the Colonies to investigate the economic conditions of British Guiana and to make recommendations for its development, passed through Trinidad recently *en route* to Georgetown. During their brief stay in this Colony they took the opportunity of paying a visit to the College on 12th November. The party, which consisted of Mr. Roy R. Wilson, M.P., and Mrs. Wilson, Mr. H. Snell, M.P., and Mr. R. R. Sedgwick, the Secretary of the Commission, arrived with His Excellency the Governor, Sir Horace Byatt, from Government House in time for afternoon tea at the Principal's. After tea they were shown round the main buildings, laboratories and the model sugar factory by Dr. Leake and Mr. Evans. A visit was also made to the cultivation area where the experiments on jute and other special crops were inspected and the lay out of the land for the students' plots, which is required by them to work out the special problems they are set as an essential part of their training, was also observed.

SPORTS.

The following are the results of the matches played by the Students of the College to date, the scorers being noted in brackets.

Association Football Club.

(*Captain:* MR. R. G. HEATH).

Oct. 18th..	Imperial College	.. 1	(Newman).
	Queen's Royal College	1	(away.)
Do. 26th..	Imperial College	..2	(Follett-Smith, Croucher).
	Combined Colleges—Queen's Royal and St. Mary's	..2	(away).
Nov. 8th ..	Imperial College	..4	(Follett-Smith 2, D. Macdonald, Croucher).
	Casuals F. C.	..2	(away).
Do. 12th..	Imperial College	..3	(Follett-Smith 2, R. G. Heath).
	Queen's Royal College	1	(away).
Do. 17th..	Imperial College	..0	
	Leaseholds United	..2	(away).
Do. 18th..	Imperial College	..3	(Follett-Smith, Sheffield, D. Macdonald.
	Trinidad Constabulary	2	(home).

The College re-assembled too late to enable the A.F.C. to enter for the Governor Wilson's Cup, but owing to the sportsmanlike attitude of the Queen's Royal College, whose team had drawn a bye in the 1st round, the Imperial College were enabled to enter for the Cup and succeeded in defeating Queen's Royal College by 3-1. The action of the Queen's Royal College is highly appreciated. In the 2nd round the College lost to Leaseholds United 2-0.

Rugby Football Club.

(*Captain:* MR. C. O. OATES).

Oct. 14th..	Imperial College	..3 pts.	(Oates)
	Trinidad Rugby Club	..32 pts.	(away).
Nov. 4th..	Imperial College	..0	
	Trinidad Rugby Club	..11 pts.	(away).
Do. 14th..	Imperial College	..3 pts.	(Oates).
	Southern Rugby Football Club	..0	(away).

Hockey Club.

(*Captain:* MR. L. H. STONE).

Nov. 5th..	Imperial College	..1	(Rutter).
	Trinidad Constabulary	1	(away).

RUBBER EXPORTS.

THE following announcement has been made by the Colonial Office with regard to the Stevenson Scheme for the restriction of the export of rubber from Ceylon and Malaya. It is evidently the intention of the Colonial Office to endeavour to stabilise the price of rubber at about 1*s.* 9*d.* per lb.

As from 1st November, the export of rubber from Ceylon and Malaya will be subject to the following regulations. It is not contemplated that any change shall be made in these regulations for a period of 12 months at least, but if it is decided at the end of that time to continue the temporary policy of restriction for a further period any changes in the regulations which may then be considered desirable may be made.

(1) If the average price of rubber in London is less than 1*s.* 9*d.* a pound, but not less than 1*s.* 3*d.* a pound, during any quarter, the percentage of standard production which may be exported at the minimum rate of duty for the ensuing quarter will be reduced by 10. If, however, the reduction to be effected under this regulation is a reduction from a figure of 100 per cent., the reduced percentage for the ensuing quarter will be 80.

(2) If such average price for any quarter is not less than 1*s.* 9*d.* a pound, but less than 2*s.* a pound, there will be no change in the percentage for the ensuing quarter. If, however, in each of three consecutive quarters such average price is not less than 1*s.* 9*d.* a pound, the percentage for the ensuing quarter will be increased by 10.

(3) If such average price for any quarter is 2*s.* a pound or over, the percentage will be increased by 10 for the ensuing quarter. If, however, the increase to be effected under this regulation is an increase from a figure of 80 per cent. the increased percentage for the ensuing quarter will be 100.

(4) If such average price is below 1*s.* 3*d.* a pound in any quarter the percentage will be reduced to 60 for the ensuing quarter.

(5) If such average price is over 3*s.* a pound in any quarter the percentage will be increased to 100 for the ensuing quarter.

(6) In no case will the percentage be increased above a figure of 100 or decreased below a figure of 60.

CONTRIBUTIONS.

THE EDITOR is prepared to consider signed articles for publication in *Tropical Agriculture.* Such articles should normally vary between 1,000 to 6,000 words and may be illustrated if desired. Rates can be obtained on application to the Editor.

THE INDEX to Volume III of *Tropical Agriculture* will be issued with the next issue, Volume IV, No. 1 (January, 1927), of the Journal.

GIFTS TO THE COLLEGE.

WE have pleasure in acknowledging with grateful thanks from Messrs. Filtrators, Ltd., of Astor Ham, Aldwych, London, through the British Engineering Manufacturers' Alliance, a No. 3 size Scale Removing Plant. The Plant has been installed to run in connection with the Sugar Factory and will be brought into operation during next working season.

THE College recently received a very useful bucket pump, the "Iron Arm" from Messrs. Henry Milward & Co., Spraying Manufacturers, Redditch, England, through their local agents. The "Iron Arm" outfit is equipped with the patent "All Ways" nozzles which may be set to give a variety of sprays ranging from a solid stream to a very fine mist. We are very grateful to Messrs. Henry Milward & Co., for this useful gift.

THE College gratefully acknowledges the gift of a complete spraying outfit from Messrs. Cooper, Pegler & Co., Ltd., 24d/26a Christopher Street, Finsbury Square, London, E.C. 2. The outfit consist of the "Cascade" Hand Power Sprayer with hose, nozzles and lengthening lance as shown on page 13 of their attractive 1926 catalogue of the Vermorel "Eclair" spraying, limewashing and disinfecting machines. This useful outfit will be used as occasion requires and will be demonstrated before classes of students of the College. Messrs. Cooper, Pegler & Co., Ltd., are regular advertisers in *Tropical Agriculture.*

BOOKS RECEIVED.

WE have to acknowledge the receipt of the following books:—Handbook of British Malaya, 1926—Captain, H. L. German, Waterlow & Sons, Ltd., London, price 2*s.* 6*d.* post free. Physical Chemistry, Its bearing on Biology—J. C. Philip, E. Arnold, price 8*s.* 6*d.* Fundamental Principles of Organic Chemistry—Moureu, G. Bell, price 12*s.* 6*d.* Tropical Gardening and Planting— H. L. Macmillan, Times of Ceylon Co., price £1 17*s.* 6*d.* Cotton and Its Production—W. H. Johnson, Macmillan & Co., Ltd., London, price 30*s.* Rubber, Its Production and Marketing—F. R. Henderson, Henderson, Helm & Co., Inc., New York. The Punjab Peasant in Prosperity and Debt—H. M. Darling, H. Mitford, Catalogue of British Scientific and Technical Books, 1926—British Science Guild, London. A Tour in West Africa—Geo. de Lachevotier, Trinidad, price 1*s.* 6*d.* (a pamphlet printed privately describing a tour in West Africa by one to whom clearly everything is new and unfamiliar). Handbook of the British West Indies, British Guiana and British Honduras—A. E. Aspinall, West India Committee. Settling in South Africa—Admiral Sir W. H. Henderson, Chas. Knight & Co., Ltd., price 6*d.*

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—Several factors have been responsible for the distinctly firmer feeling which has recently prevailed in the sugar markets. The damage to the Cuban crop was responsible for considerable alarm. Interest, however, centres around the possibility of a decline in the world production of sugar this year. Willett and Gray's first estimate, which is based upon an unrestricted Cuban crop, places this deficit at 96,813 tons. The production of Czecho-Slovakia, the chief exporting country in Europe, is estimated at 1,100,000 tons, showing a possible shortage of 400,000 tons. Cubans, 96° *c.i.f.*, United Kingdom, were quoted at 13*s.* 9*d.* on 4th November. A cabled report dated 22nd November quotes foreign sugar 96° *c.i.f.* at 15*s.* 6*d.*, preferential at 18*s.* 3*d.*, and Yellow Crystals landed, duty paid, at 19*s.*, each per cwt. Cabled reports from New York of the same date quote Cubans 96° *c.i.f.* at $3.01 per 100 lb. Futures in all cases show advances over spot quotations, September, 1927, being listed at $3.30.

COTTON.—The Bureau Report, although expected to show an increase, was larger than anticipated, the estimate being 17,454,000 bales. This is the largest estimate ever known and doubt is expressed as to the ability of the market to absorb such supplies without a severe decline in price. A scheme for enabling farmers to hold back supplies has been suggested in America but little definite information is, as yet, available. Mid-American was quoted in Liverpool at 6.85*d.* per lb. on 29th October, the corresponding figure for last year being 10.35*d.* West Indian Sea Island, Good, realised 29.00*d.* on the same date. A cabled report dated 22nd November quotes West Indian Sea Island, Good, at 28.00*d.* per lb.

CACAO.—Since our last report the market has been dull except for some speculation in Accras. The West African crop is expected to be large. Latterly colder weather has tended to increase demand. Prices on 18th October were quoted at 67*s.* to 69*s.* for good plantation Trinidad, 62*s.* to 63*s.* for fine Grenada, 72*s.* to 82*s.* for fair to fine bold Ceylon, 95*s.* to 110*s.* for Arriba, 52*s.* to 58*s.* for fair to superior Bahia, 60*s.* to 61*s.* for fine San Thomé, and 51*s.* to 53*s.* for Accra fermented (*ex quay* Liverpool), each per cwt. Business in fair fermented Accras has improved. Stocks in London on 9th October amounted to 99,002 bags compared with 127,894 and 111,070 bags in 1925 and 1924 respectively. A London cabled report dated 22nd November quotes Trinidad L.L.T. at 68*s.* per cwt., and Grenada L.L.T. at 65*s.* Prices in New York on the same date are quoted at 14*c.* per lb. for Trinidad and 13¾*c.* for Grenada.

COFFEE.—The continued heavy receipts of coffee at Rio—about 15,000 bags daily—is exercising a depressing effect upon the market. Santos, superior *c.i.f.* was quoted at 88*s.* to 90*s.* per cwt. on 18th October, and Rio, No. 7 at 71*s.* to 72*s.*, Jamaica ordinary to good was quoted at 105*s.* to 107*s.*, Mocha long berry 132*s.* to 136*s.*, East African good to fine at 135*s.* to 150*s.* and Costa Rica fair to good at 155*s.* to 165*s.*

TEA.—Latest averages show a decline and include Ceylon 19.76*d.*, Indian 17.43*d.*, Java 13.80*d.*, Nyasaland 15.41*d.*, Assam 19.25*d.* and Darjeeling 23.16*d.*, each per lb., these quotations referring to 27th October. The suggestion that supplies are being held up is not borne out by the weekly returns which show increased imports and decreased re-exports for the year to 23rd October.

RUBBER.—The exportable quota has been reduced to 80 per cent. of standard production. This announcement immediately resulted in a slight improvement in prices. Uncertainty with regard to unused licences or coupons nullified the effect of this announcement. It is felt that these licences will prevent the effect of restriction being felt during the present quarter at least. The Colonial Office apparently intends to endeavour to stabilise prices at about 1*s.* 9*d.* per lb. Spot sheet sold at 1*s.* 7¼*d.* per lb. on 3rd November and First Crêpe at 1*s.* 7¾*d.* Stocks in London on 30th October amounted to 42,141 tons compared with 4,932 tons last year.

COPRA.—The market is dull, and all types have shown a decline since our last report. Quotations on 27th October included, F.A.Q. Ceylon to London £28 10*s.*, Sun-dried Straits to Rotterdam £27 5*s.*, and Straits to Marseilles £26 5*s.*, each per ton.

GROUND-NUTS.—Prices are unsettled. Chinese sold at £19 15*s.* per ton on 27th October.

PALM AND PALM KERNEL OILS.—Palm Kernel Oil sold at £40 10*s.* and Palm Oil at £37 on 27th October, the market having remained practically unchanged during the previous month.

IT is officially announced that His Majesty King Fuad of Egypt has, on the recommendation of the British Government, signified his intention of appointing Sir John L. Maffey, K.C.V.O., C.S.I., C.I.E., to be Governor-General of the Sudan in succession to Sir Geoffrey Archer who resigned last June on account of ill-health. Sir John retired from the post of Chief Commissioner of the North-Western Frontier Province in 1924.

Subscriptions to Lord Milner's Appeal for £100,000 as an endowment fund for the Imperial College of Tropical Agriculture should be addressed to the Secretary, Imperial College of Tropical Agriculture or to the bankers of the Fund, the Colonial Bank, 29, Gracechurch Street, E.C.